U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-285 716

Lake Lulu
Polk County, Florida

(U.S.) National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

Dec 77

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO. PB285716
4. TITLE AND SUBTITLE Report on Lake Lulu, Polk County, Florida		5. REPORT DATE Prepared December 1977 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Anonymous (National Eutrophication Survey Staff)		8. PERFORMING ORGANIZATION REPORT NO. Working Paper # 263
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Northwest Environmental Research Laboratory U.S. Environmental Protection Agency 200 S. W. 35th St. Corvallis, Oregon 97330		10. PROGRAM ELEMENT NO. 1BA029 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460		13. TYPE OF REPORT AND PERIOD COVERED Final - 1973 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading	National Eutrophication Survey Lake Survey	05B 05C

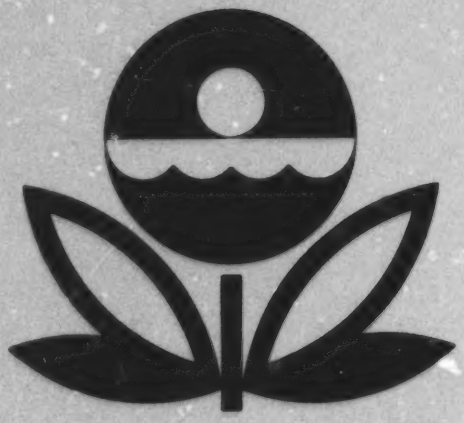
18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Release Unlimited	Unclassified	34
	20. SECURITY CLASS (This page)	22. PRICE PC-A03/MF-A01

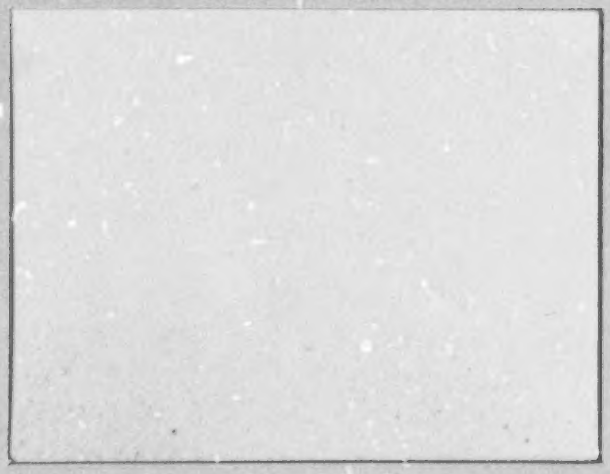
EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

PB 285 716

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES





CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

G.P.O. 699-440

REPORT

ON

LAKE LULU

POLK COUNTY

FLORIDA

EPA REGION IV

WORKING PAPER No. 263

WITH THE COOPERATION OF THE

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

AND THE

FLORIDA NATIONAL GUARD

DECEMBER, 1977

CONTENTS

	Page
Foreword	ii
List of Florida Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Introduction	1
II. Conclusions	1
III. Lake and Drainage Basin Characteristics	3
IV. Water Quality Summary	4
V. Literature Reviewed	8
VI. Appendices	9

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Florida Department of Environmental Regulation for professional involvement and to the Florida National Guard for conducting the tributary sampling phase of the Survey.

Joseph W. Landers, Jr., Secretary of the Department of Environmental Regulation; John A Redmond, former Director of the Division of Planning, Technical Assistance, and Grants; and Dr. Tim S. Stuart, Chief of the Bureau of Water Quality, provided invaluable lake documentation and counsel during the survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

Major General Henry W. McMillan (Retired), then the Adjutant General of Florida, and Project Officer Colonel Hugo F. Windham, who directed the volunteer efforts of the Florida National Guard, are also gratefully acknowledged for their assistance to the Survey.

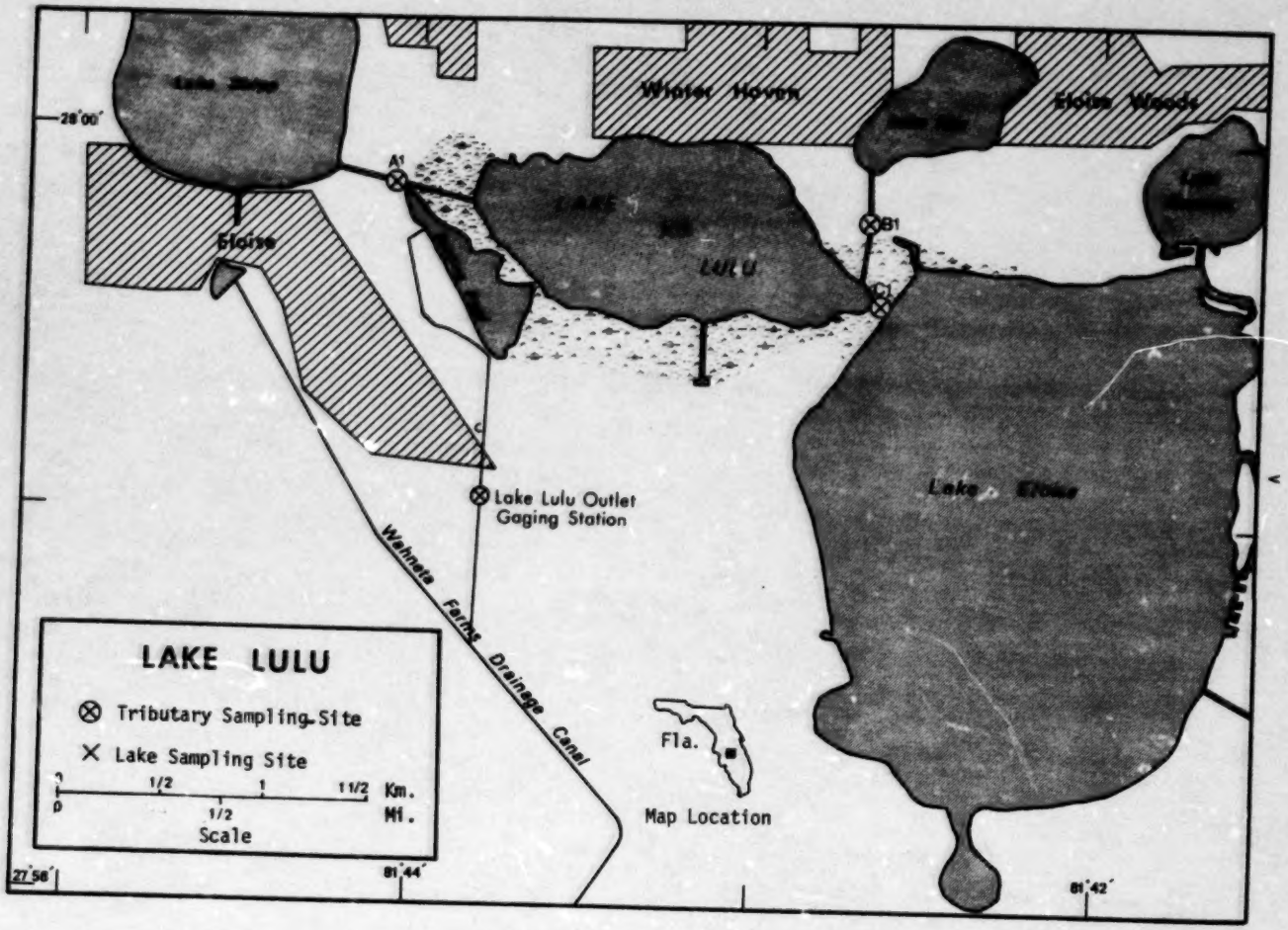
NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF FLORIDA

LAKE NAME	COUNTY
Alligator	Columbia
Apopka	Lake, Orange
Banana	Polk
Crescent	Flagler, Putnam
Doctors	Clay
Dora	Lake
East Tohopekaliga	Osceola
Effie	Polk
Eloise	Polk
George	Putnam, Volusia
Gibson	Polk
Glenada	Highlands
Griffin	Lake
Haines	Polk
Hancock	Polk
Horseshoe	Seminole
Howell	Orange, Seminole
Istokpoga	Highlands
Jessie	Polk
Jessup	Seminole
Kissimmee	Osceola
Lawne	Orange
Lulu	Polk
Marion	Polk
Minnehaha	Orange
Minneola	Lake
Monroe	Seminole, Volusia
Munson	Leon
Okeechobee	Glades, Hendry, Martin, Okeechobee, Palm Beach
Poinsett	Brevard, Orange, Osceola
Reedy	Polk
Seminole	Jackson, FL; Decatur, Seminole, GA
Seminole	Pinellas
South	Brevard
Talquin	Gadsden, Leon
Tarpon	Pinellas
Thonotosassa	Hillsborough
Tohopekaliga	Osceola
Trout	Lake
Weohyakapka	Polk
Yale	Lake

Reproduced from best available copy.


Winter Haven
Eloise Woods
28°00'
A1
B1
LAKE
LULU
Eloise
Lake Lulu Outlet
Gaging Station
Lake Eloise
Wahneta Farms Drainage Canal
LAKE LULU
Tributary Sampling Site
Lake Sampling Site
0
1/2
1
1 1/2
Km.
0
1/2
Mi.
Scale
Fla.
Map Location
27°58'
81°44'
81°42'

LAKE LULU

STORET NO. 1227

I. INTRODUCTION

Lake Lulu is one of the Winter Haven chain of lakes. The hydrology of this chain is complex, and personnel of the U.S. Geological Survey question whether realistic analyses of nutrient loadings to the lakes can be made; i.e., depending on the operation of control gates, wind direction and velocity, and other factors, flows in the connecting canals may have reversed from one sampling time to the next (Anderson, 1974). For example, during the Survey sampling year, the less-than-normal precipitation probably resulted in a net flow from Lake Lulu to Lake Eloise rather than the reverse (Dye, 1976).

It will be noted in Appendix C that daily flows could not be provided by the U.S. Geological Survey, and it cannot be determined whether net flows were to or from Lake Lulu at any of the sampling stations or times. Therefore, nutrient loads to the lake cannot be calculated; however, the canal sampling data are included in Appendix E for the record.

II. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Lake Lulu is very eutrophic. It ranked 40th in overall trophic quality when the 41 Florida lakes sampled in 1973 were compared using a combination of six lake parameters*. Thirty-nine of the lakes had less median

---

* See Appendix A.

total phosphorus, 38 had less median dissolved phosphorus, 39 had less median inorganic nitrogen, all of the others had less mean chlorophyll a, and 34 had greater mean Secchi disc transparency.

Survey limnologists reported algal blooms and observed macrophytes, including water hyacinths, along the margins and shallows.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Lake Lulu was nitrogen limited at the time the sample was collected (03/08/73). However, the high control assay yield and high inorganic nitrogen and phosphorus levels in the lake at that time (Appendix D) suggest *in situ* primary productivity may have been limited by other factors such as light penetration. The mean inorganic nitrogen to orthophosphorus ratios were consistently low (less than 2 to 1) and support the conclusion that nitrogen was the potentially limiting nutrient in Lake Lulu at the time of Survey sampling.

III. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 1.22 kilometers^2.
2. Mean depth: 1.5 meters.
3. Maximum depth: 2.7 meters.
4. Volume: 1.830×10^6 m^3.
5. Mean hydraulic retention time: 235 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)**
Unnamed Canal B-1	1.6	0.01
Unnamed Canal C-1	14.6	0.05
Minor tributaries & immediate drainage -	2.7	0.03
Totals	18.9	0.09

2. Outlet -

Unnamed Canal A-1	} 20.1***	0.00
Lake Lulu Outlet		0.09

C. Precipitation****:

1. Year of sampling: 120.3 centimeters.
2. Mean annual: 136.7 centimeters.

---

† Table of metric conversions--Appendix B.
†† Anonymous, 1971; depths estimated from soundings reported in Appendix D.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Based on net effect of factors affecting flows in connecting canals during the period of October, 1960, through September, 1968 (Anderson, 1974).
*** Includes area of lake; outflow assumed to equal sum of inflows.
**** See Working Paper No. 175.

IV. WATER QUALITY SUMMARY

Lake Lulu was sampled three times during 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two or more depths at one station on the lake (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration, and a similar sample was collected for chlorophyll a analysis. During the first visit, a single 18.9-liter depth-integrated sample was taken for algal assays. The maximum depth sampled was 2.1 meters.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR LAKE LULU
STORET CODE 1227

PARAMETER	1ST SAMPLING (3/ 8/73) 1 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (9/ 6/73) 1 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (11/ 6/73) 1 SITES RANGE	MEAN	MEDIAN
TEMP (C)	21.6 - 23.0	22.3	22.3	28.4 - 28.7	28.5	28.5	24.3 - 24.3	24.3	24.3
DISS OXY (MG/L)	0.7 - 0.7	0.7	0.7	7.2 - 7.2	7.2	7.2	8.8 - 9.0	8.9	8.9
CNDCTVY (MCROMO)	375. - 375.	375.	375.	327. - 329.	328.	328.	342. - 343.	342.	342.
PH (STAND UNITS)	8.7 - 9.4	9.0	9.0	9.4 - 9.6	9.5	9.5	8.8 - 9.0	8.9	8.9
TOT ALK (MG/L)	113. - 115.	114.	114.	72. - 73.	73.	73.	73. - 74.	74.	74.
TOT P (MG/L)	1.400 - 2.040	1.720	1.720	1.040 - 1.200	1.120	1.120	1.580 - 1.640	1.610	1.610
ORTHO P (MG/L)	0.880 - 1.220	1.050	1.050	0.570 - 0.610	0.590	0.590	1.180 - 1.200	1.190	1.190
NO2+NO3 (MG/L)	0.610 - 0.660	0.635	0.635	0.190 - 0.190	0.190	0.190	1.680 - 1.740	1.710	1.710
AMMONIA (MG/L)	0.240 - 0.620	0.430	0.430	0.150 - 0.190	0.170	0.170	0.100 - 0.130	0.115	0.115
KJEL N (MG/L)	2.800 - 3.200	3.000	3.000	7.100 - 7.200	7.150	7.150	4.000 - 4.000	4.000	4.000
INORG N (MG/L)	0.900 - 1.230	1.065	1.065	0.340 - 0.380	0.360	0.360	1.810 - 1.840	1.825	1.825
TOTAL N (MG/L)	3.460 - 3.810	3.635	3.635	7.290 - 7.390	7.340	7.340	5.680 - 5.740	5.710	5.710
CHLRPYL A (UG/L)	256.7 - 256.7	256.7	256.7	456.6 - 456.6	456.6	456.6	116.4 - 116.4	116.4	116.4
SECCHI (METERS)	0.6 - 0.6	0.6	0.6	0.2 - 0.2	0.2	0.2	0.5 - 0.5	0.5	0.5

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/08/73	1. Scenedesmus sp.	8,163
	2. Phacus sp.	5,151
	3. Lyngbya sp.	2,530
	4. Cyclotella sp.	1,988
	5. Merismopedia sp.	1,747
	Other genera	7,258
	Total	26,837
09/06/73	1. Microcystis sp.	15,690
	2. Scenedesmus sp.	2,615
	3. Chroococcus sp.	1,889
	4. Dactylococcopsis sp.	1,598
	5. Raphidiopsis sp.	1,453
	Other genera	4,068
	Total	27,313
11/06/73	1. Flagellates	3,114
	2. Fragilaria sp.	1,779
	3. Scenedesmus sp.	1,602
	4. Cyclotella sp.	1,602
	5. Cryptomonas sp.	1,602
	Other genera	9,787
	Total	19,486

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
03/08/73	1	256.7
09/06/73	1	456.6
11/06/73	1	116.4

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.600	0.444	25.2
0.050 P	0.650	0.444	25.6
0.050 P + 1.0 N	0.650	1.444	44.0
1.0 N	0.600	1.444	43.5

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Lake Lulu was very high at the time the sample was collected (03/08/73). Nitrogen alone and in combination with orthophosphorus resulted in increased algal yields, but orthophosphorus alone did not, indicating that the lake was nitrogen limited when sampled.

This conclusion is supported by the mean inorganic nitrogen/orthophosphorus ratios in the lake. At the time the assay sample was collected, the mean N/P ratio was 1/1. However, it is noted that both nitrogen and phosphorus levels remained high on all three sampling dates, and primary productivity in Lake Lulu does not appear to be limited by availability of major nutrients.

V. LITERATURE REVIEWED

Anderson, Warren, 1974. Personal communication (hydrology of Winter Haven chain of lakes). U.S. Geol. Surv., Winter Park.

Anonymous, 1972. Water resources data for Florida, Part 1: Surface water records. Vol 1: Streams of northern and central Florida. U.S. Geol. Surv., Tallahassee.

Dye, Craig W., 1976. Personal communication (review of preliminary report). FL Dept. Env. Reg., Tallahassee.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1201	ALLIGATOR LAKE	0.626	0.260	474.000	87.733	13.100	0.396
1202	LAKE APOPKA	0.102	0.230	484.176	46.611	8.200	0.019
1203	LAKE BANANA	0.660	0.260	482.667	208.600	3.600	0.293
1206	LAKE CRESCENT	0.065	0.130	473.889	10.211	10.200	0.033
1207	DOCTORS LAKE	0.084	0.120	465.555	27.100	10.600	0.028
1208	LAKE DORA	0.102	0.240	482.889	54.978	7.400	0.022
1209	LAKE EFFIE	1.480	0.410	489.000	261.433	15.000	0.950
1210	LAKE GEORGE	0.129	0.165	469.308	35.000	11.000	0.063
1211	LAKE GIBSON	0.167	0.115	470.000	19.675	10.200	0.069
1212	GLENADA LAKE	0.134	0.165	454.167	27.667	14.700	0.072
1214	LAKE GRIFFIN	0.119	0.260	481.333	66.855	6.600	0.038
1215	LAKE HAINES	0.063	0.115	462.667	26.567	10.600	0.014
1217	LAKE HANCOCK	0.772	0.195	483.500	97.900	5.600	0.158
1219	LAKE HORSESHOE	0.034	0.130	459.000	12.067	11.500	0.023
1220	LAKE HOWELL	1.260	0.285	464.000	54.117	9.000	1.175
1221	LAKE ISTOKPOGA	0.039	0.120	464.222	6.594	8.600	0.010
1223	LAKE JESSUP	0.492	0.290	487.000	76.550	7.600	0.288
1224	LAKE KISSIMMEE	0.034	0.145	463.667	24.142	8.800	0.007
1227	LAKE LIRLU	1.490	1.065	483.000	276.566	14.300	1.030
1228	LAKE MARION	0.044	0.260	468.833	29.967	7.600	0.016
1229	LAKE MINNEHAHA	0.038	0.080	435.000	8.733	7.700	0.012
1230	LAKE MINNEOLA	0.018	0.070	486.333	3.333	7.400	0.009
1231	LAKE MONROE	0.188	0.300	474.555	14.225	10.800	0.128
1232	LAKE OKEECHOBEE	0.063	0.185	472.366	14.524	9.800	0.010
1234	LAKE POINSETT	0.085	0.150	469.000	6.500	10.600	0.051
1236	LAKE REEDY	0.033	0.330	468.500	34.837	10.600	0.008
1238	LAKE SOUTH	0.074	0.130	464.000	23.167	9.000	0.028
1239	LAKE TALQUIN	0.085	0.290	462.167	9.483	14.400	0.031

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1240	LAKE THONOTOSASSA	0.695	0.095	466.167	37.700	10.200	0.565
1241	LAKE TOHOPEKALIGA	0.246	0.200	472.917	30.633	10.500	0.152
1242	TROUT LAKE	1.110	0.650	472.000	76.967	12.900	0.970
1243	LAKE WEOHYAKAPKA	0.047	0.080	458.667	7.767	8.200	0.011
1246	LAKE YALE	0.027	0.160	441.000	25.367	7.600	0.014
1247	LAKE HUNSON	1.475	0.925	486.667	140.317	12.200	0.852
1248	LAKE SEMINOLE	0.234	0.175	473.833	102.000	8.600	0.026
1249	LAKE LAWNE	2.560	1.350	494.667	84.900	10.400	0.117
1250	LAKE TARPON	0.041	0.070	480.889	6.867	9.000	0.027
1252	LAKE ELOISE	0.486	0.170	465.333	70.233	12.200	0.339
1258	LAKE JESSIE	0.051	0.090	452.667	26.300	10.800	0.011
1261	EAST LAKE TOHOPEKALIGA	0.042	0.070	440.833	5.167	9.400	0.007
1264	PAYNE'S PRAIRIE LAKE (NO	1.260	0.140	476.000	88.200	7.400	1.210

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1201	ALLIGATOR LAKE	25 (10)	29 (10)	30 (12)	18 (7)	10 (4)	18 (7)	130
1202	LAKE APOPKA	50 (20)	38 (15)	10 (4)	38 (15)	74 (29)	70 (28)	280
1203	LAKE BANANA	23 (9)	29 (10)	20 (8)	5 (2)	100 (40)	23 (9)	200
1206	LAKE CRESCENT	65 (26)	70 (27)	33 (13)	80 (32)	48 (18)	50 (20)	346
1207	DOCTORS LAKE	60 (24)	76 (30)	60 (24)	55 (22)	34 (12)	56 (22)	341
1208	LAKE DORA	53 (21)	35 (14)	18 (7)	33 (13)	90 (35)	68 (27)	297
1209	LAKE EFFIE	5 (2)	10 (4)	3 (1)	3 (1)	0 (0)	10 (4)	31
1210	LAKE GEORGE	45 (18)	54 (21)	48 (19)	43 (17)	23 (9)	43 (17)	256
1211	LAKE GIBSON	40 (16)	81 (32)	45 (18)	70 (28)	48 (18)	40 (16)	324
1212	GLENADA LAKE	43 (17)	54 (21)	85 (34)	53 (21)	3 (1)	38 (15)	276
1214	LAKE GRIFFIN	48 (19)	29 (10)	23 (9)	30 (12)	95 (38)	48 (19)	273
1215	LAKE HAINES	70 (28)	81 (32)	75 (30)	58 (23)	34 (12)	78 (31)	396
1217	LAKE HANCOCK	18 (7)	43 (17)	13 (5)	13 (5)	98 (39)	28 (11)	213
1219	LAKE HORSESHOE	93 (37)	70 (27)	80 (32)	78 (31)	20 (8)	65 (26)	406
1220	LAKE HOWELL	11 (4)	23 (9)	69 (27)	35 (14)	60 (23)	3 (1)	201
1221	LAKE ISTOKPOGA	85 (34)	76 (30)	65 (26)	93 (37)	69 (27)	89 (35)	477
1223	LAKE JESSUP	28 (11)	18 (7)	5 (2)	25 (10)	83 (32)	25 (10)	184
1224	LAKE KISSIMMEE	90 (36)	63 (25)	73 (29)	65 (26)	65 (26)	99 (39)	485
1227	LAKE LULU	3 (1)	3 (1)	15 (6)	0 (0)	8 (3)	5 (2)	34
1228	LAKE MARION	78 (31)	29 (10)	53 (21)	50 (20)	83 (32)	73 (29)	366
1229	LAKE MINNEHAHA	88 (35)	91 (36)	95 (38)	85 (34)	78 (31)	80 (32)	517
1230	LAKE MINNEOLA	100 (40)	98 (38)	98 (39)	100 (40)	90 (35)	93 (37)	579
1231	LAKE MONROE	38 (15)	15 (6)	28 (11)	75 (30)	26 (10)	33 (13)	215
1232	LAKE OKEECHOBEE	68 (27)	45 (18)	40 (16)	73 (29)	53 (21)	89 (35)	368
1234	LAKE POINSETT	58 (23)	60 (24)	50 (20)	95 (38)	34 (12)	45 (18)	342
1236	LAKE REEDY	95 (35)	13 (5)	55 (22)	45 (18)	34 (12)	95 (38)	337
1238	LAKE SOUTH	63 (25)	70 (27)	69 (27)	68 (27)	60 (23)	56 (22)	386
1239	LAKE TALQUIN	55 (22)	20 (8)	78 (31)	83 (33)	5 (2)	53 (21)	294

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	SDD- MEAN SEC	MEAN CHLOHA	1S- MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1240	LAKE THONOTOSASSA	20 (8)	85 (34)	58 (23)	40 (16)	48 (18)	15 (6)	266
1241	LAKE TOHOPEKALIGA	33 (13)	40 (16)	38 (15)	48 (19)	40 (16)	30 (12)	229
1242	TROUT LAKE	15 (6)	8 (3)	43 (17)	23 (9)	13 (5)	8 (3)	110
1243	LAKE WEOHYAKAPKA	75 (30)	91 (36)	83 (33)	88 (35)	74 (29)	84 (33)	495
1246	LAKE YALE	98 (39)	58 (23)	90 (36)	63 (25)	83 (32)	75 (30)	467
1247	LAKE MUNSON	8 (3)	5 (2)	8 (3)	8 (3)	16 (6)	13 (5)	58
1248	LAKE SEMINOLE	35 (14)	48 (19)	35 (14)	10 (4)	69 (27)	63 (25)	260
1249	LAKE LAWNE	0 (0)	0 (0)	0 (0)	20 (8)	43 (17)	35 (14)	98
1250	LAKE TARPON	83 (33)	98 (38)	100 (40)	90 (36)	60 (23)	60 (24)	491
1252	LAKE ELOISE	30 (12)	50 (20)	63 (25)	28 (11)	16 (6)	20 (8)	207
1258	LAKE JESSIE	73 (29)	88 (35)	88 (35)	60 (24)	26 (10)	84 (33)	419
1261	EAST LAKE TOHOPEKALIGA	80 (32)	98 (38)	93 (37)	98 (39)	55 (22)	99 (39)	523
1264	PAYNE'S PRAIRIE LAKE (NO	11 (4)	65 (26)	25 (10)	15 (6)	90 (35)	0 (0)	206

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1230	LAKE MINNEOLA	579
2	1261	EAST LAKE TOHOPEKALIGA	523
3	1229	LAKE MINNEHAHA	517
4	1243	LAKE WEOHYAKAPKA	495
5	1250	LAKE TARPON	491
6	1221	LAKE ISTOKPOGA	477
7	1246	LAKE YALE	467
8	1224	LAKE KISSIMMEE	455
9	1256	LAKE JESSIE	419
10	1219	LAKE HORSESHOE	406
11	1215	LAKE HAINES	396
12	1238	LAKE SOUTH	386
13	1232	LAKE OKEECHOBEE	368
14	1228	LAKE MARION	366
15	1206	LAKE CRESCENT	346
16	1234	LAKE POINSETT	342
17	1207	DOCTORS LAKE	341
18	1236	LAKE REEDY	337
19	1211	LAKE GIBSON	324
20	1208	LAKE DORA	297
21	1239	LAKE TALQUIN	294
22	1202	LAKE APOPKA	280
23	1212	GLENADA LAKE	276
24	1214	LAKE GRIFFIN	273
25	1240	LAKE THONOTOSASSA	266
26	1248	LAKE SEMINOLE	260
27	1210	LAKE GEORGE	256
28	1241	LAKE TOHOPEKALIGA	229

41

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	1231	LAKE MONROE	215
30	1217	LAKE HANCOCK	213
31	1252	LAKE ELOISE	207
32	1264	PAYNE'S PRAIRIE LAKE (NO	206
33	1220	LAKE HOWELL	201
34	1203	LAKE BANANA	200
35	1223	LAKE JESSUP	184
36	1201	ALLIGATOR LAKE	130
37	1242	TROUT LAKE	110
38	1249	LAKE LAWNE	98
39	1247	LAKE MUNSON	58
40	1227	LAKE LULU	34
41	1209	LAKE EFFIE	31

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 - cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR FLORIDA 8/25/75

LAKE CODE 1227 LAKE LULU

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 58.8

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1227A1	38.6	-0.01	-0.01	0.07	-0.14	-0.10	0.39	0.14	0.09	-0.07	-0.10	-0.20	-0.08	-0.00
122781	1.6	0.01	0.01	0.02	0.02	0.01	-0.01	0.01	0.02	0.03	0.03	0.02	0.01	0.01
1227C1	14.6	0.06	0.11	0.02	0.10	0.06	-0.28	-0.04	-0.01	0.08	0.22	0.16	0.09	0.05
1227ZZ	2.7	0.02	0.03	0.05	0.03	0.01	0.01	0.02	0.04	0.06	0.05	0.03	0.02	0.03

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 58.8
SUM OF SUB-DRAINAGE AREAS = 57.5

TOTAL FLOW IN = 1.05
TOTAL FLOW OUT = 0.0

NOTE *** SEE WRITE UP ON WINTER HAVEN CHAIN OF LAKES

NO DAILY FLOW DATA ON FILE

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/08/25

122701
27 59 45.0 081 43 17.0
LAKE LULU
12105 FLORIDA

11EPALES 2111202
3 0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/03/08	11	15 0000	23.0		24	375	9.40	113	0.240	2.800	0.660	1.220
	11	15 0005	21.6	0.7		375	8.70	115	0.620	3.200	0.610	0.880
73/09/06	11	35 0000	28.7		9	329	9.60	72	0.150	7.200	0.190	0.570
	11	35 0007	28.4	7.2		327	9.40	73	0.190	7.100	0.190	0.610
73/11/06	13	28 0000	24.3		18	342	9.00	74	0.100	4.000	1.740	1.200
	13	28 0001	24.3	9.0		342						
	13	28 0005	24.3	8.8		343	8.80	73	0.130	4.000	1.680	1.180

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/03/08	11	15 0000	1.400	256.7
	11	15 0005	2.040	
73/09/06	11	35 0000	1.200	456.6
	11	35 0007	1.040	
73/11/06	13	28 0000	1.640	116.4
	13	28 0005	1.580	

21-C

APPENDIX E

TRIBUTARY DATA

STORET RETRIEVAL DATE 75/08/25

1227A1
28 00 00.0 081 44 30.0
UNNAMED STREAM
12097 7.5 ELOISE
T/LAKE LULU
BRDG ON US 17 NE OF ELOISE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	10	25	0.010K	2.200	0.052	0.035	0.175
73/04/15	16	10	0.630	4.100	0.890	0.043	0.360
73/05/18	12	50	0.460	2.730	0.540	0.030	0.230
73/06/17	14	35	0.570	9.800	2.000	1.370	1.950
73/07/14	12	00	0.010K	1.400	0.050	0.021	0.125
73/08/17	14	29	0.011	1.470	0.011	0.020	0.113
73/09/16	10	20	0.078	2.650	0.012	0.021	0.145
73/10/13	11	23	2.700	10.500	7.200	0.052	0.295
73/11/18	11	52	0.008	2.700	0.016	0.072	0.300
73/12/16	15	30	0.480	3.700	0.480	0.128	0.400
74/01/20	15	20	3.600	11.500		0.550	1.400
74/02/02	15	12	0.016	1.900	0.010	0.070	0.250

K VALUE KNOWN TO BE
LESS THAN INDICATED

23

STORET RETRIEVAL DATE 75/08/25

122781
27 59 30.0 081 42 30.0
UNNAMED STREAM
12 7.5 ELOISE
T/LAKE LULU
BRDG ON RT 540A
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	10 56		0.320	4.600	0.043	0.760	1.610
73/04/15	16 42		0.138	4.900	0.039	1.440	2.100
73/05/18	13 20		0.011	5.460	0.065	0.760	1.400
73/06/17	15 00		0.010K	7.800	0.045	0.440	1.300
73/07/14	12 25		0.010K	4.800	0.032	0.640	0.990
73/08/17	15 00		0.022	5.000	0.200	0.640	0.930
73/10/13	11 45		0.570	4.000	0.450	0.960	1.150
73/11/18	12 25		1.180	2.100	0.084	1.600	1.880
73/12/16	15 45		1.090	3.900	0.108		1.880
74/01/20	15 49		0.970	2.900	0.065	2.100	2.600
74/02/02	15 30		0.320	2.500	0.015	1.900	2.400

K VALUE KNOWN TO BE
LESS THAN INDICATED

24

STORET RETRIEVAL DATE 75/08/25

122701
27 59 30.0 081 42 30.0
UNNAMED STREAM
12 7.5 ELOISE
T/LAKE LULU
SECONDARY RD BRDG BTWN LKS LULU & ELOISE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/18	10 43		0.476	3.100	0.520	0.770	1.720
73/04/15	16 25		0.189	5.040	0.032	1.470	2.200
73/05/18	13 15		0.010K	4.800	0.065	0.410	1.300
73/06/17	14 45		0.012	2.800	0.025	0.360	0.500
73/07/14	12 15		0.010K	3.990	0.050	0.590	1.000
73/08/17	14 53		0.033	1.980	0.140	0.730	1.050
73/09/16	10 35		0.750	6.500	0.023	0.650	1.000
73/10/13	11 39		0.019	2.700	0.023	0.315	0.490
73/11/18	12 10		1.400	3.000	0.028	1.500	1.950
73/12/16	15 38		1.180	3.000	0.044	1.650	1.800
74/01/20	15 34		0.500	2.150	0.025	1.100	1.450
74/02/02	15 24		0.380	2.500	0.015	1.950	2.400

K VALUE KNOWN TO BE
LESS THAN INDICATED